# HOW DO TRAFFIC SIGNALS WORK?

When installed under conditions that justify its use, a traffic signal is a valuable device for traffic control. However, an ill-advised or poorly designed signal is not only annoying, but can be dangerous to pedestrians, cyclists and drivers. Therefore, it is essential that before traffic signals are installed, engineering studies be made by qualified personnel to determine the most appropriate location and mode of operation for a signal.

A traffic signal assigns alternate right-of-way for different traffic movements. Specifications for signals and their placement, as well as minimum warrants for their installation and use are contained in a publication titled, Manual on Uniform Traffic Control Devices, published by the U.S. Department of Transportation.

A signal that minimizes vehicle stops and delays, also cuts fuel consumption and vehicle emissions. The signal is operated by a controller which switches the signal indications on and off to assign right-of-way correctly and safely. Two basic kinds of controllers are used: pretimed (also known as fixed-timed) and actuated (sometimes called smart signals).
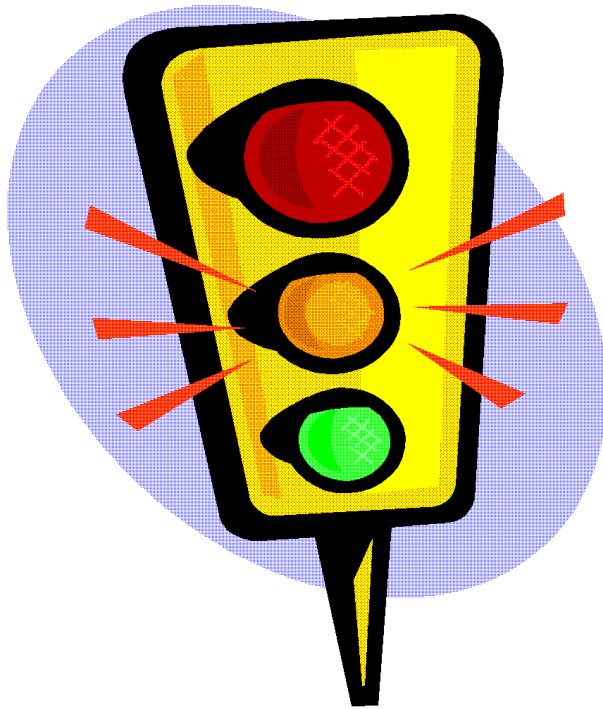
Pretimed controllers operate on a predetermined, regularly repeated sequence of signal indications. They are used frequently where traffic volumes are predictable and stable.

Actuated controllers differ from pretimed controllers in that their signal indications are not of fixed length, but can change in response to variations in traffic demand. They are frequently used where traffic volumes fluctuate widely or irregularly, or where interruptions to major-street flow must be minimized.

Signal timing is the division of the cycle into portions for each of the phases. Signal timing is developed to minimize vehicle delays and provide safe movement through the signalized location. Signal timing is constrained by the **cycle length**: the time for one complete sequence of all the signal indications. Cycle lengths usually fall between 45 and 120 seconds.

There are three common techniques for coordinating traffic signals to operated as a system. This is done to improve the progressive flow of traffic along a major street or network of streets. Signal progression can be obtained with either pretimed and/ or actuated signals.

A **programmed system** is one where a single master controller sends instructions to other controllers telling them what to do. This programmed system requires telemetry connections between intersections so that these messages can be sent and received.

The second method, **time based coordination,** replaces the master controller and the communications system with a very accurate time clock at each location. This clock acts to synchronize each controller by referring all intersections to one base time cycle.

The third system, **computer coordination,** uses a central computer control to provide directions to individual signal controllers. This central computer is connected to vehicle detector loops which allow it to adjust signal timing throughout the system to meet changing traffic demands.